

REMARKS

This Response and Amendment is filed in response to the Notice of Non-Compliant Amendment mailed October 20, 2006, which was mailed by the PTO in response to the Amendment and Request for Continued Examination ("RCE") filed on October 16, 2006. According to the Notice of Non-Compliant Amendment, claims 37 and 72 filed with the RCE included improper status identifiers. This Response and Amendment makes appropriate correction to the status identifiers of claims 37 and 72. Reconsideration is respectfully requested.

Claims 1-96 were previously pending in this application. Applicants amend claims 29, 34 and 69. Claim 29 is amended to correct an obvious typographical error. The amendments to independent claims 34 and 69 are non-narrowing and have been made solely for the purpose of clarifying the meaning of the language previously recited by these claims to emphasize that the optical fiber must be substantially devoid of any location that is included in more than two of the resonance cavities. As a result, claims 1-96 are still pending for examination with claims 1, 34, 69, 88, 89, 92 and 95 being independent claims. No new matter has been added.

Summary of Exchange of Voicemail with Examiner

On September 8, 2005, the Examiner issued a Final Rejection in this case that was mailed on September 16, 2005. Pursuant to MPEP § 1.136(a), a reply to that Office Action was due by March 16, 2006. On March 16, 2006, Applicants filed a Notice of Appeal along with a Petition for Extension of Time Under 37 CFR § 1.136(a). Pursuant to MPEP § 1205.01, 37 CFR § 41.37(a), and 37 CFR § 1.136(a), Applicants should have been permitted to extend the time period allotted to file an Appeal for up to five months from the date on which the Appeal brief was due (two months from the filing of the Notice of Appeal, i.e. May 16, 2006). Thus, Applicants should have been permitted to extend the above indicated time period until October 16, 2006. On September 28, 2006, however, the Patent Office issued a Notice of Abandonment, indicating that the time for response had expired on September 16, 2006. On September 29, 2006, Applicants' representative Michael J. Pomianek, Reg. No. 46,190 left a voicemail for Examiner Sung H. Pak explaining the error. On October 3, 2006, the Examiner left a voicemail for Applicants' representative, agreeing that the Notice of Abandonment had been issued inadvertently, and confirming that a Request for Continuing Examination filed by October 16,

2006 along with a Petition for Five Month Extension of Time would be timely filed. The Examiner also indicated that the Abandonment would be withdrawn. Applicants thank the Examiner for resolving this issue.

Claim Rejections – 35 U.S.C. § 103

In the September 16, 2005 Office Action, the Patent Office rejected pending claims 1-29, 31-64, 66-71 and 85-96 as being obvious under 35 U.S.C. § 103 in view of U.S. Patent No. 6,407,855 B1 (“MacCormack”) and rejected pending claims 30, 65 and 72-84 as being obvious under 35 U.S.C. § 103 in view of MacCormack further in view of Dianov et al., “Three-cascaded 1407-nm Raman laser based on phosphorus-doped silica fiber”, Optics Letters, Mar. 15, 2000 (“Dianov”). Applicants respectfully request reconsideration.

As an initial matter, Applicants do not concede that MacCormack is properly prior art to the Applicants’ claimed inventions. The Applicants reserve the right to establish an invention date for the claimed inventions that is on or before October 29, 1999, which is the effective §102(e) date of MacCormack apparently relied on by the Patent Office.

As explained below, MacCormack does not teach or suggest all of the limitations of the inventions recited in the claims, either alone or in combination with any other reference. In particular, there are significant differences between the claims and MacCormack other than the number of reflectors used in the claimed invention. Furthermore, without conceding that there would have been any motivation to combine MacCormack and Dianov along the lines suggested in the Office Action, even if the proposed combination were made, Dianov still does not cure the deficiencies of MacCormack in rendering any of the rejected claims unpatentable.

a. Rejection of Claims 1-33 under 35 U.S.C. § 103(a)

Claims 2-33 all depend from claim 1. Claims 1-29 and 31-33 were rejected under 35 U.S.C. § 103(a) as being unpatentable over MacCormack. Claim 30 was rejected under 35 U.S.C. § 103(a) over MacCormack in view of Dianov. The Office Action states that MacCormack discloses an optical fiber with all the limitations set forth in these claims, except it does not explicitly teach the use of more than two pairs of reflectors overlapping in a manner claimed in the instant application. The Office Action further states that the provision of this

feature would have been an obvious modification of MacCormack in view of the use of three or more pairs of reflective gratings being allegedly “well known and common in the art”. Applicants respectfully disagree. MacCormack cannot render these claims unpatentable because, *inter alia*, the optical fiber disclosed in MacCormack even as it is proposed to be modified in the Office Action (i.e. by the addition of additional pairs of conventional reflective gratings) still cannot meet all of the claim limitations of independent claim 1. For example, MacCormack does not teach the invention as recited in claim 1 so as to include the limitations expressed in the resonance frequency formula specifically recited in independent claim 1.

Claim 1 requires that each resonance cavity of index M have a resonance frequency c/λ_{sm} , where:

$$\lambda_{sm}^{-1} = \lambda_p^{-1} - \sum_M \lambda_{rm}^{-1}$$

The index numbers are integers. In this formula, (c/λ_{rm}) is a frequency within the gain spectrum of the Raman active material contained in the gain medium, where c is the speed light.

Consider application of the above formula for the first two of multiple cavities:

For the first cavity, the recited formula yields:

$$(1) \quad \lambda_{s1}^{-1} = \lambda_p^{-1} - \lambda_{r1}^{-1}$$

For the second cavity, the formula yields

$$(2) \quad \lambda_{s2}^{-1} = \lambda_p^{-1} - \lambda_{r1}^{-1} - \lambda_{r2}^{-1}$$

Substituting expression (1) into expression (2) yields:

$$(3) \quad \lambda_{s2}^{-1} = \lambda_{s1}^{-1} - \lambda_{r2}^{-1}$$

Expression (3) clearly indicates that the resonance wavelength λ_{s2} of the second cavity (the cavity designated by m =2) is a function of at least the resonance wavelength λ_{s1} of the first cavity (the cavity designated by m =1). One instance wherein the resonance wavelength of the second cavity is a function of at least the resonance wavelength of the first cavity is where energy

having the resonance wavelength of the first cavity pumps the second cavity.

MacCormack does not teach or suggest the foregoing as recited in claim 1. MacCormack at Figure 4 and the accompanying description (MacCormack at column 8 lines 42-58) teaches a multiple wavelength source with two overlapping resonator cavities. The pair of gratings 42A and 42B, which are tuned to 1475 nm, forms one of the cavities, and the pair of gratings 44A and 44B, which are tuned to 1485 nm, forms the other of the cavities. Though each resonator cavity of Figure 4 resonates at a slightly different wavelength, there is no teaching that in the combination recited in claim 1 that the resonant wavelength of one cavity be functionally related to that of another cavity.

In Figure 4 of MacCormack, the resonant wavelengths of the cavities formed by the grating pairs are within the *same* Stokes order. For example, the typical bandwidth within a given Stokes order is roughly 30 nm (e.g., see MacCormack at Column 7, lines 17-23). The pair of gratings 42A and 42B is tuned to 1475 nm, which is only 10 nm different than the wavelength of 1485 nm to which the second pair of gratings 44A and 44B is tuned. This difference is clearly within 30 nm and hence within the same Stokes order. Furthermore, MacCormack elsewhere states that pairs of gratings having tuned wavelengths of 1475 nm and 1485 are in fact both within the same (in this instance, the fifth) Stokes order (see MacCormack at column 57-63). That the resonant wavelengths are within the same Stokes order is consistent with both cavities being pumped by the same wavelength energy from the same pump source, as is in fact shown in Figure 4 (see pump source indicated at the left hand side of Figure 4). Accordingly, as understood by one of ordinary skill in the art, the resonant wavelengths of the cavities are functionally related to the wavelength of the pump and the Stokes shift of the applicable gain media, but there is no teaching that the resonant wavelengths of one cavity have the functional relationship to that of another cavity, as recited in claim 1. Therefore the recited formula of claim 1 is not taught, suggested or enabled by MacCormack in the combination as recited in claim 1 of the present application.

Claim 1 further recites that for a resonance cavity having an index with a value N (where N is greater than one), the resonance cavity has a resonance frequency (c/λ_{sn}) and overlaps only with a resonance cavity having a resonance frequency ($c/\lambda_{s(n-1)}$) and with a resonance cavity

having a resonance frequency ($c/\lambda_{s(n+1)}$), i.e., the resonance cavities of the immediate prior and immediate subsequent index values. Claim 1 further recites the caveat that the resonance cavity with the highest index value overlaps only with the resonance cavity of the immediate prior index value. This limitation is also not taught or suggested by MacCormack; where MacCormack may be considered to overlap additional gratings pairs it does not teach the structure as recited in claim 1. See, for example, Figure 5 of MacCormack, which is described at column 9, lines 4-7 thereof as being “similar to FIG. 4” and having “multiple resonant cavities” that “overlap”. In Figure 5 all of the cavities formed by gratings pairs represented by reference numerals 12, 14, 16, 18 and 20A/B overlap all of the cavities represented by gratings pairs 13, 15, 17, 19 and 21A/B.

Because each limitation has not been shown by the Patent Office to have been taught or suggested in MacCormack, claim 1 is believed to be patentable over MacCormack for at least the reasons given above. Furthermore, Dianov also does not appear to cure the above discussed deficiencies of MacCormack in disclosing, suggesting or enabling all of the limitations of claim 1. Furthermore, while the Applicants do not concede that MacCormack teaches the further limitations added by claims 2-33, Applicants note that these claims depend from claim 1 and, thus, are patentable over MacCormack, or MacCormack in view of Dianov, for at least the reasons discussed above with regard to claim 1.

Accordingly, Applicants submit that claim 1 and its dependent claims are not anticipated by or obvious in light of MacCormack, either alone or in combination with any other reference, and request that the rejection be withdrawn.

b. Rejection of Claims 34-68 under 35 U.S.C. § 103(a)

Claims 35-68 all depend from claim 34. Claims 34-64 and 66-68 were rejected under 35 U.S.C. § 103(a) as being unpatentable over MacCormack. Claim 65 was rejected under 35 U.S.C. § 103(a) over MacCormack in view of Dianov. The Office Action states that MacCormack discloses an optical fiber with all the limitations set forth in these claims, except it does not explicitly teach the use of more than two pairs of reflectors overlapping in a manner claimed in the applicable claims. The Office Action further states that the provision of this feature would have been an obvious modification of MacCormack in view of the use of three or

more pairs of reflective gratings being allegedly “well known and common in the art”. Applicants respectfully disagree. MacCormack cannot render these claims unpatentable because, *inter alia*, the optical fiber disclosed in MacCormack even as it is proposed to be modified in the Office Action (i.e. by the addition of additional pairs of conventional reflective gratings) still cannot meet all of the claim limitations of independent claim 34.

Claim 34 has been amended to clarify that the optical fiber must be “substantially devoid of a location that is included in more than two of the resonance cavities.” As shown below, MacCormack, alone or in combination with Dianov, does not appear to disclose, suggest or enable this limitation. Rather, in all of the examples disclosed in MacCormack that contain more than two resonance cavities, there are locations on the optical fiber that are included in more than two of the resonance cavities. For example, as noted above, Figure 5 of MacCormack is considered by MacCormack to be similar to Figure 4 and clearly includes additional cavities. Figure 5 shows three gain media (46, 48, 50) and multiple and overlapping resonance cavities formed by multiple grating sets. Clearly, many points on the fiber depicted in Figure 5 are included in more than two resonance cavities. Accordingly, MacCormack does not teach or suggest an optical fiber as recited in claim 34 that is substantially devoid of a location that is included in more than two of the resonance cavities, nor has the Patent Office pointed to any teaching or suggestion in the prior art to that effect. Applicants thus submit that MacCormack is distinguishable at least on this basis and request that the rejection be withdrawn.

Because each limitation has not been shown by the Patent Office to have been taught or suggested in MacCormack, claim 34 is believed to be patentable over MacCormack for at least the reasons given above. While the Applicants do not concede that MacCormack teaches the further limitations added by claims 35-68, Applicants note that these claims depend from claim 34 and, thus, are patentable over MacCormack, alone or in view of Dianov, for at least the reasons discussed above with regard to claim 34.

c. Rejection of Claims 69-87 under 35 U.S.C. § 103(a)

Claims 70-87 all depend from claim 69. Claims 69-71 and 85-87 were rejected under 35 U.S.C. § 103(a) as being unpatentable over MacCormack. Claims 72-84 were rejected under 35 U.S.C. § 103(a) over MacCormack in view of Dianov. The basis for the present rejection is

essentially the same as that stated above for independent claim 34. As with claim 34, discussed above, claim 69 as amended, and its dependent claims, requires that the optical fiber be substantially devoid of a location that is included in more than two of the resonance cavities. For at least the same reasons as discussed above with respect to claim 34, Applicants submit that MacCormack does not anticipate or render obvious claim 69, and request that the objection be withdrawn.

Because each limitation has not been shown by the Patent Office to have been taught or suggested in MacCormack, claim 69 is believed to be patentable over MacCormack for at least the reasons given above. While the Applicants do not concede that MacCormack nor Dianov teaches the further limitations added by claims 70-87, Applicants note that these claims depend from claim 69 and, thus, are patentable over MacCormack, either alone or in combination with Dianov, for at least the reasons discussed above with regard to claim 69.

d. Rejection of Claims 88-91 under 35 U.S.C. § 103(a)

Claims 88 and 89 are both independent claims. Claim 90 depends from claim 88, and claim 91 depends from claim 89. The last Office Action stated that a ratio of the power of the output wavelength relative to the power of the pump wavelength of at least about 20% of the theoretical limit is inherently met by the operation of the MacCormack device. Thus, the Patent Office appears to be relying on a theory of inherent anticipation with respect to the efficiency limitations of claims 88-91 in its contention that MacCormack renders these claims unpatentable as obvious.

As an initial matter, Applicants point out that the burden is on the Patent Office to establish the inherency in the prior art of each and every one of the claim limitations.¹ The Office Action does not meet this burden because it fails to provide any reasonable rational or technical reasoning to support the proposition that the requirement in claims 88-91 that the ratio

¹ To meet this burden, the Examiner must provide a rationale or evidence tending to shown inherency. The fact that a certain characteristic may be present in the prior art is not sufficient to establish the inherency of that result or characteristic (see MPEP §2112). The limitation must necessarily be present in the teachings of the reference, such that it would be recognized as such by persons of ordinary skill in the art (MPEP §2112 and §2131.01). Inherency may not be established by mere probabilities or possibilities (MPEP §2112). "In relying upon a theory of inherency, the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art" (MPEP §2112 quoting Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Int. 1990) (emphasis in original quotation)).

of the output power to input power be at least about 20% of a theoretical limit would necessarily flow from MacCormack. Indeed, MacCormack simply indicates that the relative output power at each of the output wavelengths can be controlled by the use of long-period gratings as *loss* elements. Col. 6 Lines 5-24. MacCormack does not indicate that an efficiency of 20% of a theoretical limit (or any other percentage of a theoretical limit) could or would necessarily be achieved by the disclosed structure. Thus, the Patent Office has not, in the present rejection, established an adequate basis in fact and/or technical reasoning to reasonably support the assertion that this limitation recited in claims 88-91 is inherently satisfied by MacCormack, as required under the law (see MPEP § 2112).

Because each limitation has not been shown by the Patent Office to have been taught or suggested in MacCormack, claims 88 and 89 are believed to be patentable over MacCormack for at least this reason. While the Applicants do not concede that MacCormack teaches the further limitations added by claims 90-91, Applicants note that these claims depend from claims 88 and 89 and, thus, are patentable over MacCormack for at least the reasons discussed above with regard to claims 88 and 89.

e. Rejection of Claims 92-94 under 35 U.S.C. § 103(a)

Claim 92 is rejected under 35 U.S.C. § 103(a) as being unpatentable over MacCormack. The Office Action states that MacCormack discloses an optical fiber with all the limitations set forth in the claim, except it does not explicitly teach the use of more than two pairs of reflectors overlapping in a manner claimed in the instant application. The Office Action further states that the provision of this feature would have been an obvious modification of MacCormack in view of the use of three or more pairs of reflective gratings being allegedly “well known and common in the art”. Applicants respectfully disagree.

Claim 92 requires at least three resonance cavities, each having a different resonance frequency from the others. More specifically, claim 92 requires at least one resonance cavity, which overlaps with only two resonance cavities, where one of the two cavities has a resonance frequency that is one Raman Stokes shift higher than the at least one resonance cavity and the other of the resonance cavities has a resonance frequency that is one Raman Stokes shift lower

than that of the at least one cavity. As discussed above with respect to claims 1-33, this configuration is not taught, suggested or enabled by MacCormack.

As noted above in the discussion concerning claim 1, MacCormack at Figure 4 and the accompanying description (MacCormack at column 8 lines 42-58) teaches a multiple wavelength source with two overlapping resonator cavities. However, the pairs of gratings have resonance wavelengths *within the same Stokes order*, which clearly does not meet the express language of claims 92-94. Claims 92-94, in addition to requiring three cavities, expressly recite that one of the cavities have a resonance frequency that is *one Raman Stokes shift higher* than the at least one resonance cavity and the other of the resonance cavities has a resonance frequency that is *one Raman Stokes shift lower* than that of the at least one cavity.

Claims 93 and 94 both depend from claim 1. While the Applicants do not concede that MacCormack teaches the further limitations added by claims 93-94, Applicants note that these claims depend from claim 1 and, thus, are patentable over MacCormack for at least the reasons discussed above with regard to claim 1.

f. Rejection of Claims 95-96 under 35 U.S.C. § 103(a)

Claim 96 depends from claim 95. Claims 95-96 were rejected under 35 U.S.C. § 103(a) as being unpatentable over MacCormack. The basis for the present rejection of independent claim 95 appears to be essentially identical as that articulated for independent claim 1. As with claim 1, claim 95 includes a formula that requires the resonance frequency for each resonance cavity to be based on the sum of the resonance frequencies for the resonance cavities of lower index number. For at least the reasons discussed above with respect to the formula of claim 1, claim 95 is thus also distinguishable over MacCormack. Claim 95 further recites that “at least two resonance cavities do not overlap.” Where MacCormack, according to its own description, considers in Figure 5 the overlapping of multiple resonant cavities (see column 9, lines 5-7 of MacCormack), the cavities are not arranged such that “at least two cavities do not overlap”, as recited in claim 95. While Applicants do not concede that MacCormack teaches the further limitations added by claim 96, Applicants note that this claim depends from claim 95 and, thus, is patentable over MacCormack for at least the reasons discussed above with regard to claim 95.

CONCLUSION

This Response and Amendment is considered to address all matters raised by the Examiner in the outstanding Office Action mailed September 16, 2005, and Notice of Non-Compliant Amendment mailed October 20, 2006. Applicants believe the pending application is now in condition for allowance. Reconsideration is respectfully requested of all outstanding issues.

Please do not hesitate to contact the undersigned if any issues are deemed to remain unresolved.

No fees are considered to be due. However, if it is determined that an additional fee is due, or that an overpayment has been made, please debit or credit, as appropriate, Deposit Order Account 50-2343.

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